

Systematic Study on Bryozoans from the South Sea in Korea  
II. Smittinidae

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한국 남해산 태충류의 계통분류학적 연구  
II. 입이끼벌레과

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적 요

한국 남해산 태충류의 계통분류학적 연구의 일환으로 1969년부터 1991년까지 남해 연안과 여러 도서지방의 15개 지역으로부터 채집된 입이끼벌레류를 동정한 결과 *Parasmittina contraria* sp. nov. 과 *Smittina malleolus*, *Parasmittina elongata*, *Parasmittina crosslandi*, *Smittoldea reticulata*의 4 한국미기록종을 포함한 11종이 밝혀졌다. 이로서 한국산 입이끼 벌레류는 모두 4속 21종이 되며, 이 중에서 19종이 남해에서 서식하고 있다. 본 연구에서 밝혀진 11종의 한국산 입이끼벌레류의 검색표를 만들었으며 신종과 한국미기록종에 대해서는 기재를 하였고 도판을 작성하였다.

Key words : Systematics, Bryozoa, Smittinidae, Korea.

## INTRODUCTION

Family Smittinidae (Bryozoa) is one of the most successful group of bryozoans (Soule and Soule, 1973). It is a large and varied taxon (Osburn, 1952). Nevertheless, only a few works have been carried out relatively recently on this group showing great variations among species. These recent works include Soule and Soule (1973) who recorded 28 species of this family, including 20 new ones, and Hayward and Thorpe (1990).

The taxonomic studies on Smittinidae from Korea have been done by Okada (1923), who reported five species from the Korea Strait. Since then, 11 species including one new species were added to the Korean fauna by the Korean workers (Rho and Kim, 1981; Rho and Seo, 1984, 1986, 1988).

For the systematic study on the bryozoans from the South Sea, collections were made from 15 localities (Fig. 1) along the coastal lines and islands of the South Sea, from 1969 to 1991. Some fragments of specimens were cleaned in clorox, and coated with gold for photography which was made with scanning electron microscope. The classification of the family was based on the systems of Osburn (1952), Harmer (1957), and Soule and Soule (1973).

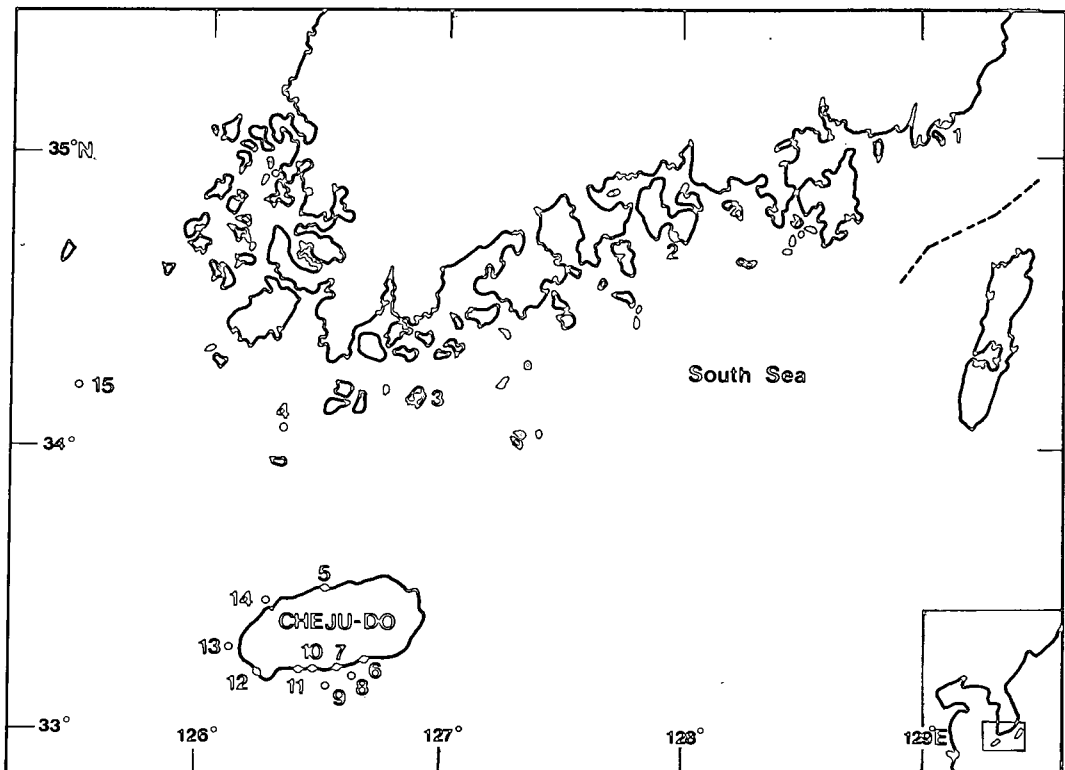


Fig. 1. A map showing the localities where the materials were collected.

1. Mip'o (尾浦); 2. Sangju-ri (尙州里); 3. Ch'öngsando (靑山島); 4. Hoenggando (橫干島); 5. Port Cheju (濟州港); 6. Wimi-ri (爲美里); 7. Sögwip'o (西歸浦); 8. Supsöm (林島); 9. Pömsöm (虎島); 10. Pöphwan (法還); 11. Taep'o (大浦); 12. Mosülp'o (幕瑟浦); 13. Ch'agwido; 14. Piyangdo (飛揚島); 15. Manjaedo.

## SYSTEMATIC ACCOUNTS

Phylum Bryozoa Ehrenberg, 1831 태형동물 문  
 Class Gymnolaemata Allman, 1856 나후 강  
 Order Cheilostomata Busk, 1852 순구 목  
 Suborder Ascophora Levinsen, 1909 유낭 아목  
 Family Smittinidae Levinsen, 1909 입이끼벌레 과

## Key to the Genera of Korean Smittinidae

1. Frontal wall tremocyst ..... 2  
    Frontal wall pleurocyst ..... 3
2. Lyrula developed ..... *Smittina*  
    Lyrula absent ..... *Codonellina*
3. Median suboral avicularium present ..... *Smittodea*  
    Median suboral avicularium absent ..... *Parasmittina*

Genus *Smittina* Norman, 1903 입이끼벌레 속

\*1. *Smittina malleolus* (Hincks, 1884) 해머입이끼벌레(신칭) (Pl. 1)

*Porella malleolus* Hincks, 1884 (p. 361, pl. 13, fig. 5); Kirkpatrick, 1890 (p. 16); Thornely, 1905 (p. 122); 1907 (p. 190).

*Smittina smittiella*: Osburn, 1952 (p. 404, pl. 47, figs. 11, 12).

*Smittina malleolus*: Harmer, 1957 (p. 921, pl. 63, figs. 7-10); Powell, 1967 (pp. 170, 171, pl. 3, fig. 12).

Collection localities. Mip'o, Apr. 25, 1975 (B. J. Rho); Sögwip'o, May 22, 1982 (J. I. Song).

Description. Colony encrusting on seaweeds and other bryozoans. Zooecia very small, in longitudinal rows. Frontal wall with numerous small pores. Orifice with cardelles and lyrula. Median suboral avicularium with serrate rostrum, directed proximally, situated above lyrula. Sometimes, one or a pair of avicularia situated on lateral margins of peristome. Peristome lower, forming rather deep secondary sinus on either side of avicularian rostrum. Ovicell large, prominent, with pores similar to frontal wall.

Remarks. Harmer (1957) described large, acute, elongate and narrow frontal avicularium. But, no such avicularia occur on the Korean specimens.

Distribution. Korea (South Sea); Pacific Ocean (China Sea, Galapagos Islands, Ecuador, New Zealand, Strait of Celebes); Atlantic Ocean (Florida, Bay of Santos, Caribbean Sea, West Indies); Indian Ocean (Ceylon, Red Sea).

Genus *Parasmittina* Osburn, 1952 측입이끼벌레 속

Key to the species of Korean *Parasmittina*

1. Lyrula absent ..... *P. elongata*

\*: indicates the species new to the Korean fauna.

- Lyrula present.....2  
 2. Spine absent.....*P. triangularis*  
     Spine present.....3  
 3. Spine 1, avicularium spatulate ..... *Parasmittina contraria* sp. nov.  
     Spines 1-3, avicularium ligulate..... *Parasmittina crosslandi*

\*2. *Parasmittina elongata* (Okada and Mawatari, 1936) 길쪽입이끼벌레 (Pl. 2)

*Smittina elongata* Okada and Mawatari, 1936 (p. 69, pl. 10, fig. 7, text-fig. 8).

*Parasmittina elongata*: Menon, 1972 (pp. 74, 75, figs. 3,6,7).

Collection localities. Mosŭp'o, Jun. 18, 1985 (B. J. Rho).

Description. Colony encrusting on other bryozoans. Zooecia long, arranged in longitudinal rows alternately. Frontal wall granular, with moderately sized areolar pores. Orifice with cardelles, no lyrula. Peristome thin, slightly elevated, circular. Unilateral avicularium long and narrow, proximo-lateral to peristome, directed proximally. Ovicell globular, with pores.

Remarks. Menon (1972) observed the presence of 6 spines or spine bases in his specimens. The present author couldn't find any spines in the Korean materials, as Okada and Mawatari (1936). This incongruousness seems to be resulted from the geographical variation between the Pacific and the Indian Oceans.

Distribution. Korea (South Sea); Japan (Izu Peninsula); Indian Ocean (Southeast coast of India).

3. *Parasmittina triangularis* (Mawatari, 1952) 세모측입이끼벌레

Previous records in Korea: Wŏlsŏng, Apr. 10, 1985 (Song, 1985); May 9, 1985 (Song, 1985); Jun. 9, 1985 (Song, 1985); Sŏch'ŏn, Jun. 7, 1985 (Song, 1985); Piyangdo, Jun. 20 (Rho and Seo, 1986).

Collection localities. Taep'o, Jan. 16, 1985 (J. E. Seo).

\*4. *Parasmittina crosslandi* (Hastings, 1930) 술측입이끼벌레 (신칭) (Pl. 3)

*Smittina crosslandi* Hastings, 1930 (p. 726).

*Parasmittina crosslandi*: Osburn, 1952 (p. 418, pl. 48, fig. 12); Soule, 1961 (p. 37); Soule and Soule, 1964 (p. 27); Cook, 1968 (pp. 214, 215); Powell, 1971 (p. 773); Soule and Soule, 1973 (pp. 382-384, fig. 2, E,F); Banta, 1980 (p. 388).

Collection localities. Sŏgwip'o, May 19, 1983 (S. J. Yoon).

Description. Colony encrusting on other bryozoans. Zooecia rectangular or polygonal. Frontal wall granular, with irregularly sized areolar pores. Orifice rounded, more transverse on proximal border, with cardelles and lyrula which truncate at tip. Peristome developed on sides, forming long and narrow sinus, with 1 to 3 spines on distal portion. Avicularia variable in form, 1 or a pair of large or small oval ones situated on frontal wall, and large or small ligulate ones proximal to orifice, one of which replaced by enlarged acute form, with serrate rostrum. All of avicularia directed proximally. Ovicell not found.

**Remarks.** The specimens from Korea are different from the Osburn's in the numbers of spines. Osburn (1952) described that three to five oral spines often present in marginal zooecia.

**Distribution.** Korea (South Sea): Pacific Ocean (Gulf of California to Colombia, Taboga Island, Tiburon Island, Panama Canal); Atlantic Ocean (Senegal to Gana).

\*5. *Parasmittina contraria* sp. nov. 반향조두체입이끼벌레 (신칭) (Pls. 4,5)

**Type specimen.** Holotype collected at Sögwip'o on Jul. 19, 1979 by H. K. Kim.

**Other collection localities:** Sögwip'o, Dec. 13, 1969 (B. J. Rho); Aug. 1, 2, 1970 (B. J. Rho); Supsöm (60m deep), Feb. 2, 1971 (B. J. Rho); Taep'o, Jan. 16, 1985 (J. E. Seo); Pömsöm, Jan. 17, 1985 (J. E. Seo); Piyangdo, Jun. 19, 1985 (J. E. Seo); Port Cheju, Jun. 21, 1985 (J. E. Seo). All of the specimens were collected from fish nets and are deposited at the Department of Biology, Chonju Woosuk University.

**Description.** Colony encrusting on sponges (*Discodermia japonica*) loosely, tubular, erect. Zooecia elongate, quadrate, pentagonal, flat, slightly convex, separated by distinct sutures. Frontal wall covered by large granules, rough, with areolar pores. Orifice(or) orbicular with lyrula(ly) as wide as sinus or wider. Secondary orifice formed by peristome, erect at lateral sides of orifice and then lacelike form, forming u-shaped sinus(s). 1 strong spine base situated in triangular depression at distal margin of orifice. Four kinds of avicularia: 1) small elliptical or subspatulate (small star), situated on one or both distal sides of peristome, occasionally absent, directed distally; 2) small spatulate(\*), on front variously situated and oriented; 3) large spatulate (large\*), on front proximal to peristome, directed lateroproximally; 4) large pointed (large star), on side of peristome, rostrum elevated, directed distally, generally replacing large spatulate one. Ovicell not found.

**Etymology.** The "contraria", from Latin, meaning "opposite", refers to the opposed large pointed avicularium.

Table 1. Comparison between *Parasmittina contraria* sp. nov. and *P. tubulata*

	<i>P. tubulata</i>	<i>P. contraria</i>
Frontal wall	pleurocyst	pleurocyst
Orifice	with lyrula	with lyrula
Spine	absent	present (1)
Peristome	high, with 3 or 4 stout, pointed processes	more or less developed
Sinus	U-shaped	U-shaped
Avicularia	small short spatulate, giant broad spatulate, small pointed or subspatulate, large pointed	small short spatulate, giant broad spatulate, subspatulate, large pointed
Direction of large pointed avicularium	distally	distally
Distribution	California	Korea(Cheju-do)

**Remarks.** It is characteristic of this new species that a large pointed avicularium is directed distally. Generally in the genus *Parasmittina*, the large avicularium is directed proximally. *Parasmittina tubulata* (Osburn, 1952) is the most similar to this new species in the kinds and orientation of avicularia. But the new species has only one spine, and the peristome is lower than in *P. tubulata* (Table 1).

Genus *Smittioidea* Osburn, 1952 태양입이끼벌레 속

Key to the species of Korean *Smittioidea*

1. Mandible semicircular.....*S. prolifica*
2. Mandible long and acute.....*S. reticulata*

6. *Smittioidea prolifica* Osburn, 1952 입이끼벌레

Previous records in Korea: Socotra rock, Apr. 7, 1984 (Rho and Seo, 1986).

Collection localities. Sangju-ri, Jun. 24, 1981 (J. E. Seo).

\*7. *Smittioidea reticulata* (MacGillivray, 1842) 망태양입이끼벌레 (신칭) (Pl. 6).

*Lepralia reticulata* J. MacGillivray, 1842 (p. 467).

*Smittia reticulata*: Kirkpatrick, 1888 (p. 81).

*Smittina reticulata*: Canu and Bassler, 1920 (p. 456); 1925 (pp. 39, 40); 1928 (pp. 41, 42); 1929 (pp. 337-339, pl. 39, figs. 7-10); Borg, 1930 (pp. 91, 92, fig. 108); Borg, 1933 (p. 536); Kramp, 1934 (p. 19); Marcus, 1940 (pp. 280, 281, fig. 144); Lagaaij, 1952 (pp. 94, 95, pl. 9, fig. 5); Kluge, 1975 (pp. 513, 514, fig. 274).

*Smittioidea reticulata*: Osburn, 1952 (pp. 409, 410, pl. 48, figs. 9, 10); Lagaaij, 1963 (p. 196, pl. 6, fig. 1); Soule, 1961 (pp. 34, 35); Hayward and Ryland, 1979 (pp. 108, 109, fig. 39); Banta, 1980 (p. 388, fig. 24, 82); Harmelin and d'Hondt, 1992 (p. 29).

Collection localities. Sŏgwip'o, Apr. 13, 1973 (B. J. Rho); Supsŏm (10m deep), Jul. 14, 1987 (J. W. Lee).

**Description.** Colony encrusting on seaweeds. Zooecia irregular rectangular. Frontal wall granular, rough, with areolar pores. Orifice rounded with transverse proximal border, with cardelles and lyrula. Peristome slightly erect, sometimes 2 spines on distal border, forming deep and round sinus on proximal border. Suboral avicularium long and acute, directed proximally. Ovicell embedded, with pores.

**Distribution.** Korea (South sea); Pacific Ocean (Gulf of California, Hawaii, Galapagos Islands, Chatham Islands); Atlantic Ocean (Gulf of Mexico, Barents Sea to Morocco, Mediterranean Sea, Northern West France, Denmark, Norway; Arctic Ocean (Skagerrak Strait, Kattegat Strait).

Genus *Codonellina* Bassler, 1934 종이끼벌레 속

Key to the Species of Korean *Codonellina*

1. Only median suboral avicularium present .....2

- Both median suboral avicularium and frontal avicularium present..... 3
2. Mandible ligulate ..... *C. obtusata*  
 Mandible acute ..... *C. acuta*
3. Mandible both ligulate and spatulate..... *C. spatulata*  
 Mandible both acute and spatulate..... *C. montferrandii*

8. *Codonellina obtusata* (Ortmann, 1890) 무딘종이끼벌레

Previous records in Korea: Korea Strait, 1917 (Okada, 1923); Sögwip'o, Jul. 13, 1979 (Rho and Seo, 1984); Ch'ongsando, Jul. 25, 1981 (Rho and Seo, 1984).

Collection localities. Sangju-ri, May 24, 1981 (J. E. Seo); Pöphwan (5m deep), Jan. 19, 1985 (J. E. Seo).

9. *Codonellina acuta* (Ortmann, 1890) 종이끼벌레

Previous records in Korea: Sögwip'o, Jul. 10, 1965 (Rho and Kim, 1981); Dec. 12, 1969 (Rho and Kim, 1981); Dec. 26, 1971 (Rho and Kim, 1981); Mip'o, Apr. 26, 1975 (Rho and Kim, 1981); Hongdo, Jul. 7, 1978 (Rho and Kim, 1981); Sögwip'o, Jul. 13, 1979 (Rho and Kim, 1981); Port Cheju, Jun. 21, 1985 (Rho and Seo, 1986); Piyangdo, Jun. 20, 1985 (Rho and Seo, 1986).  
 Collection localities. Piyangdo, Jun. 19, 1985 (J. E. Seo).

10. *Codonellina spatulata* Okada and Mawatari, 1936 스파투라종이끼벌레

Previous records in Korea: Sögwip'o, Apr. 3, 1975 (Rho and Seo, 1986); Ch'ongsando, Jul. 25, 1981 (Rho and Seo, 1984); Söch'on, Mar. 16, 1985 (Song, 1985).

Collection localities. Sögwip'o, Jul. 13, 1973 (B. J. Rho); Sangju-ri, May 24, 1981 (J. E. Seo).

11. *Codonellina montferrandii* (Audouin, 1826) 철빛종이끼벌레

Previous records in Korea: Sögwip'o, Oct. 18, 1973 (Rho and Seo, 1984); Mundo, Dec. 3, 1978 (Rho and Seo, 1984).

Collection localities. Wimi-ri, Jul. 8, 1972 (B. J. Rho); Mip'o, Dec. 9, 1974 (B. J. Rho).

## ABSTRACT

The Korean bryozoans belonging to the Smittinidae, collected at 15 localities from the South Sea during the period from 1969 to 1991, were studied taxonomically. They are found to consist of eleven species, including one new species, *Parasmittina contraria* sp. nov. Of remaining 10 species, following four are known to be new to the Korean fauna: *Smittina malleolus*, *Parasmittina elongata*, *Parasmittina crosslandi* and *Smittioidea reticulata*. Up to now, it is known that the Korean Smittinidae comprises 21 recorded species, including 19 species found from the South Sea. Eleven species are dealt with in the present report, with presentation of keys to the species of each genus, and photographic illustrations for the new species and those new to the Korean fauna.

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## EXPLANATION OF PLATES 1~6

PLATE 1. *Smittina malleolus* (Hincks, 1884)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with avicularium (arrow) situated within peristomial sinus and ovicell (ov).

Fig. 3. Arrows indicate avicularia situated on lateral margins of peristome.

Fig. 4. Avicularium with serrate rostrum in detail.

PLATE 2. *Parasmittina elongata* (Okada and Mawatari, 1936)

Fig. 1. Arrangement of zooecia. Orifice (or) with cardelles (arrow).

Fig. 2. Peristome (pe), elongate avicularium (av) and perforate ovicell (ov).

PLATE 3. *Parasmittina crosslandi* (Hastings, 1930)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with small oval avicularium(\*). Small arrows indicate cardelles and large one indicates lyrula.

Fig. 3. Orifice with one to three spines (sp). Various avicularia: small long pointed (small star), large long pointed (large star), large oval (large\*) and ligulate (triangle).

PLATE 4. *Parasmittina contraria* sp. nov.

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with small spatulate(\*), large spatulate (large\*) and small subspatulate avicularium (small star) on side of peristome.

Fig. 3. Large pointed avicularium (large star). Orifice has lyrula (ly).

PLATE 5. *Parasmittina contraria* sp. nov.

Fig. 1. Orifice with one spine (sp).

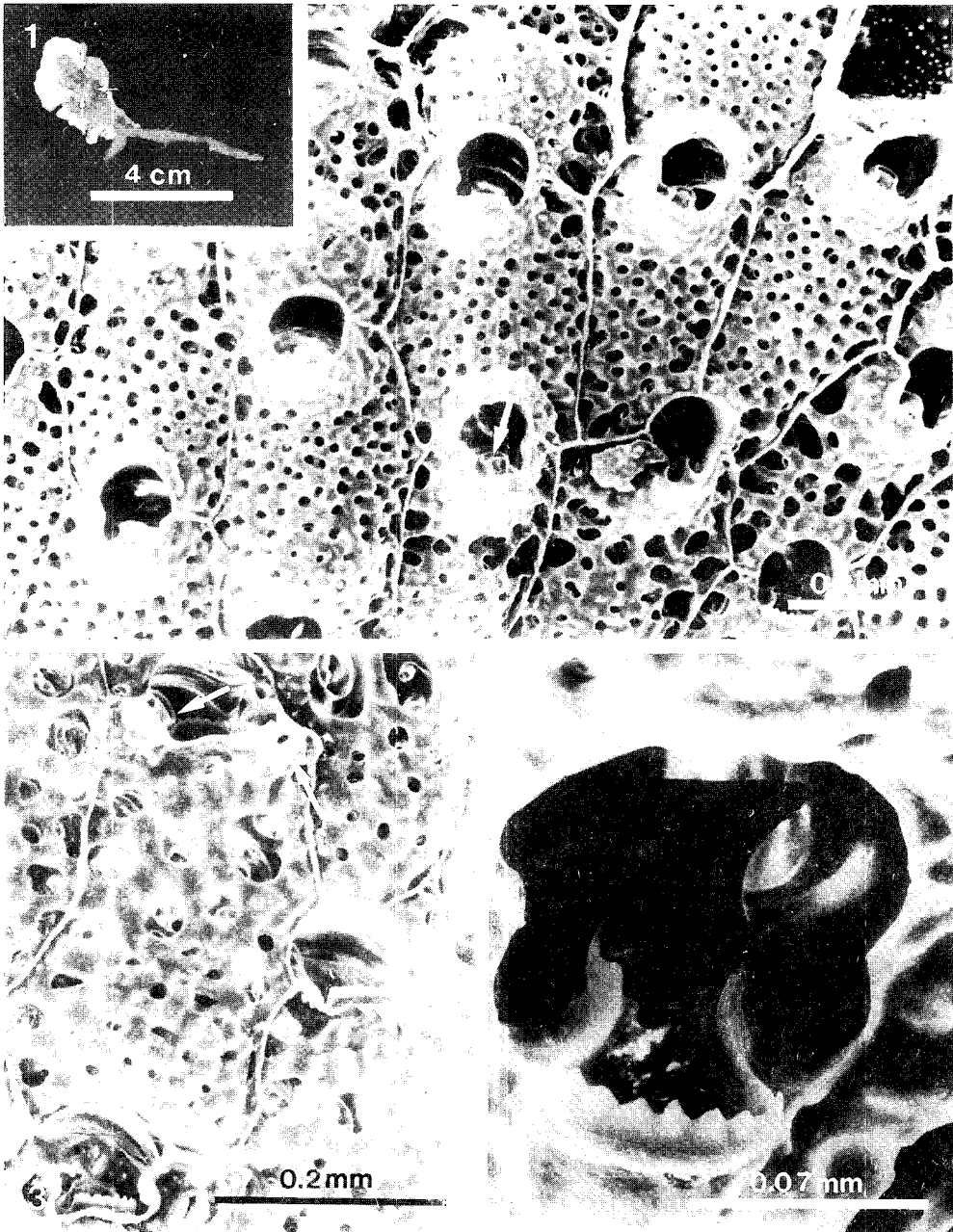
Fig. 2. Orifice (or) with sinus (s).

PLATE 6. *Smittoidea reticulata* (MacGillivray, 1842)

Fig. 1. Arrangement of zooecia with ovicell (ov).

Fig. 2. Orifice (or) with narrow sinus (s), spine (sp) and avicularium (av).

PLATE 1



## PLATE 2

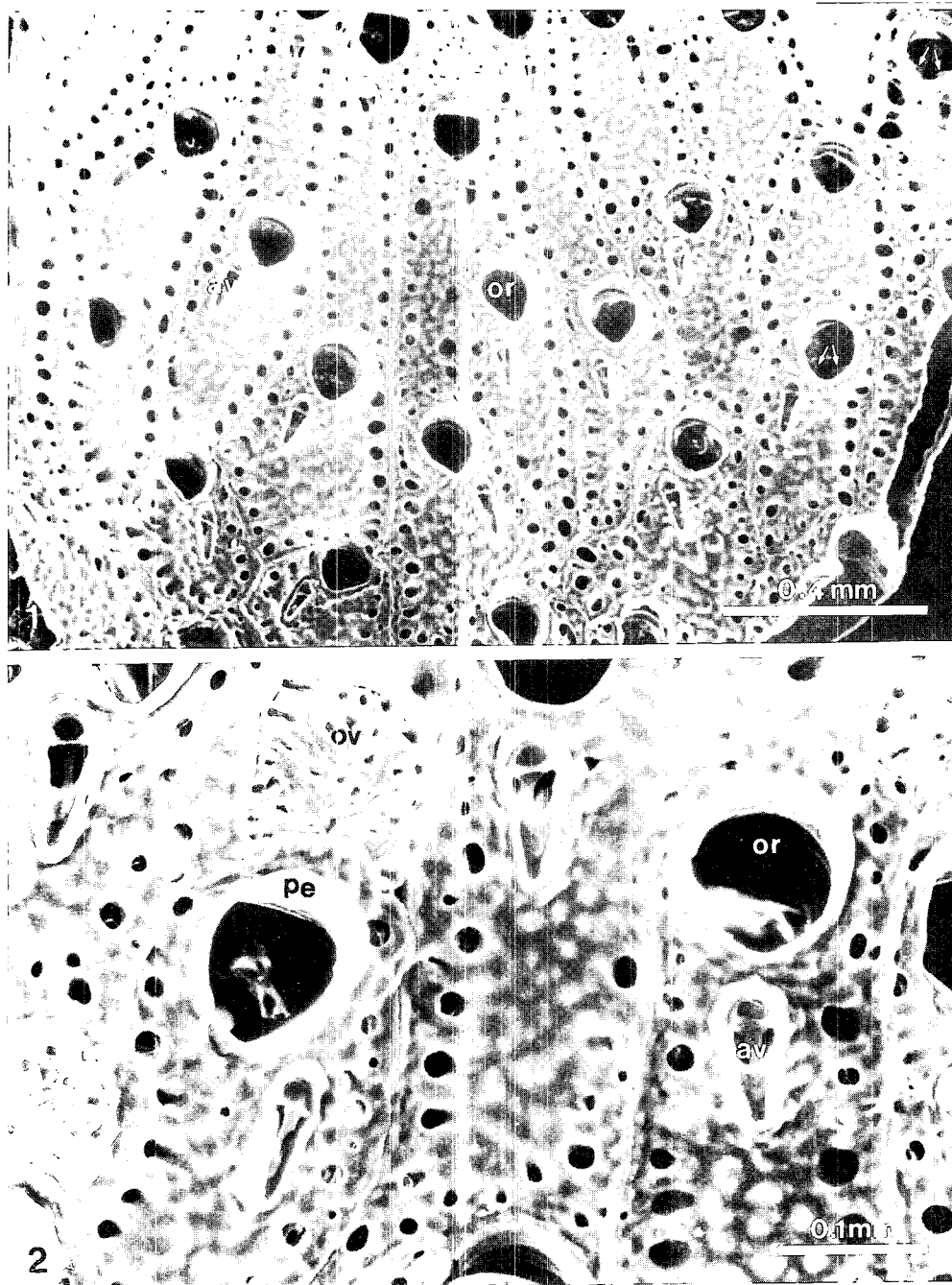


PLATE 3

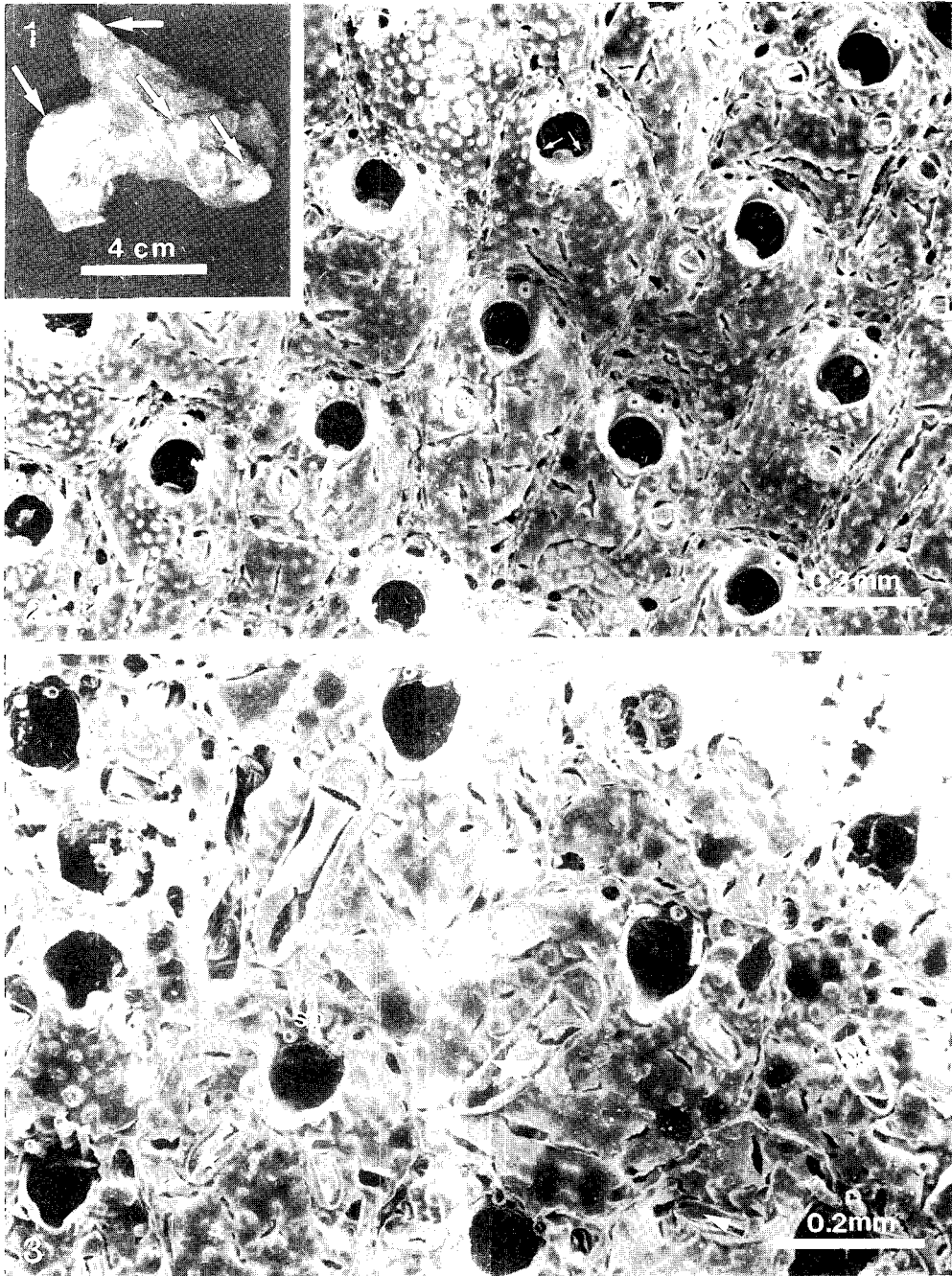
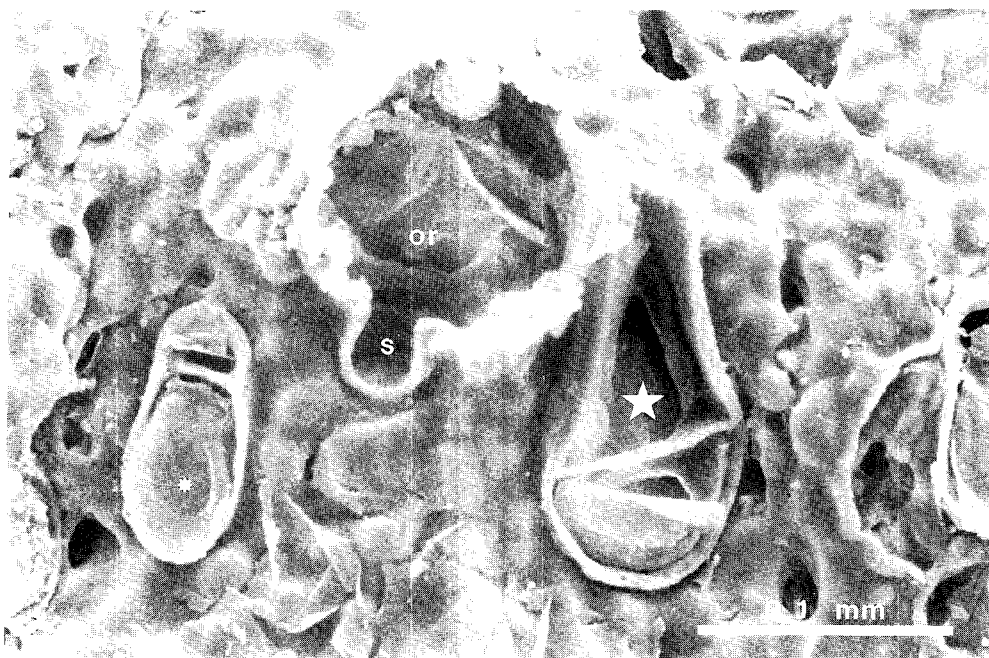


PLATE 4



PLATE 5





## PLATE 6

